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Agricultural Memorandum No 299

Forecast hatch dates of Nematodirus larvae based on 2" soil temperatures

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Following Ag. Mem. 295, the larval hatch data used therein were examined in relation to estimated 2" soil temperatures at Cockle Park.

Using the approach described in Ag. Mem. 286, estimates of daily maximum and minimum 2" soil temperatures were made:-

1. It was assumed that the 0900 GMT reading at 4" was an acceptable approximation to the 2" minimum

2. For maximum temperature the following equations were used:-

January:	$X = S + 2^{\circ}F$
February :	$X = S + 3^{\circ}F$
March:	$X = S + \frac{1}{2}h + 4\frac{1}{2}^{\circ}F$
April) May):	$X = S + h + 3\frac{1}{2}^{\circ}F$

where X = 2" maximum temperature

S = 8" soil temperature at 0900 GMT

h = daily sunshine in hours and tenths

(The equations for February, March and April were established in Ag. Mem. 286; those for January and May were derived in a similar way)

Attempts to relate hatch dates to threshold temperatures of running 5-day means of maximum and mean daily 2" soil temperatures as well as to cumulative means, i.e. mean of first two, three, four etc days were unsuccessful and this approach was abandoned in favour of regression analysis using mean 2" soil temperatures (mean = $\frac{1}{2}$ (estimated maximum and minimum)) during March.

Comparison of estimated 10% hatch date against estimated mean 2" soil temperatures gave the following correlations:-

Period	"r"
1.3 to 15.3	-0.84
6.3 to 15.3	-0.89
1.3 to 20.3	-0.84
1.3 to 25.3	-0.81

Regression analysis using March 6th to 15th temperatures for the years 1955 to 1959 and 1964 and 1969 gave

$$d_{10} = 201.5 - 3.94\ t$$

/where

where d_{10} = estimated 10% hatch date in days from March 1st

and t = estimated mean 2" soil temperature March 6th to 15th

The standard error of the estimate of d_{10} is 2.88 days.

A similar analysis for estimated peak date gave

$$d_p = 174.1 - 2.89t$$

with r = -0.84 and the standard error of the estimate of d_p = 3.17 days.

The distribution of errors in estimated hatch dates in the individual years are shown in the following table:

Year	Est 10% date	Actual	Est Peak date	Actual
	days from March 1st			
1955	56	56	67	69
56	45	42	59	49
57	22	22	42	38
58	52	55	64	71
59	31	28	49	49
64	43	49	58	57
65	53	59	65	65
66	33	40	50	52
67	32	32	49	60
68	40	26	55	51
69	56	52	67	67

The actual hatch dates given are means of field and experimental data in some cases; these dates are somewhat uncertain since the sampling interval was usually about fourteen days.

Conclusions

Although this method gives slightly better results than that using the 1 foot earth temperatures, the gain in accuracy does not justify the extra time and effort required in the application.

Any comments or suggestions on this paper should be sent to the author.

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December 1969